FIRST THINGS FIRST

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AGENDA ITEM: FTF Tobacco Tax Revenue Projections/Modeling

BACKGROUND: As part of the December 2011 agenda the Board approved the engagement of L. William Seidman Research Institute, W. P. Carey School of Business at ASU in an ISA to perform an assessment of tobacco tax revenue forecasts up to 2030.

The objectives of this effort were to:

- Segment the Arizona smoker population, based upon the application of key characteristics/traits and trends drawn in part from an extensive literature review, to estimate changes in the size of each "market" segment over time;
- Formulate detailed tax revenue forecasts for 2011-2030 for three distinct scenarios (optimistic, expected and worst case), based upon historical evidence, statistics, and the Arizona smoker segmentation, using a Cohort Survival model;
- Provide indicative sensitivity analyses and confidence intervals for the tax revenue estimates, to provide a realistic, ultimate floor on revenues;
- Marry the three 2011-2030 revenue forecast scenarios with interest projections and fund balances, to develop a long term sustainable model for First Things First.

Included under this item is a copy of the full report. The first three objectives were met through this report. The fourth objective will be addressed through a subsequent agenda item.

CEO RECOMMENDATION(S):

- Board receives the report.
- Board provide guidance to the CEO on the questions of
    - having the model updated annually
    - commissioning a survey of Arizona smokers to better understand their purchasing and consumption behaviors

DETAIL:

L. William Seidman Research Institute, W. P. Carey School of Business at ASU completed its initial draft report in late March 2012. This effort resulted in a written report and a full blown revenue forecasting model which is sensitive to a wide range of variables, and generates multiple "what if" scenarios with upper and lower boundaries when run through a statistical program called @Risk. In considering these results, it is important to understand that each run results in varying "actual" points. These are always within a range established by the underlying base assumption for each variable, thus the model (no matter how "scientific") is an estimate.

This fact is made particularly clear when one considers that the forecasts offered in an earlier draft presented to the Board Finance Committee were much higher than those seen here. This is due to the replacement of one key variable, Gross State Product elasticity of demand, with an Unemployment elasticity of demand coefficient. The change has particular impact on later projections in the forecast period, when the state is assumed to reach a natural rate of unemployment. However, based on feedback from the subcommittee, it was determined that these more conservative projections represented a more accurate reflection of what might be seen given past history.

The fundamental conclusion of this report is that FTF's Tobacco Tax collections will not fall as radically as previously considered. In fact, relative stability can be expected from this fund source assuming quite modest and realistic returns (in subsequent years) in population growth and economic conditions.

Current tobacco tax "actual" collections are estimated to be just under $130 million. This aligns well with the expected projection under this forecasting model of $132.5 million, and is well above the lower boundary of $120.9 million projected by the model.

Through this effort, it was revealed that little public data exits on the usage/consumption of tobacco, and the data that does exist is often national or even international in nature. Ultimately the model's predictive ability is only as good as the underlying data used to make the projections. This raises two questions for FTF as we move forward:

- Is there value in having the model updated periodically, incorporating actuals and refining/revising future projections on known data points, such as previous year's actual collections, population, unemployment rates, and economic growth?
- Should FTF (individually and/or with other potentially interested parties) commission a survey of tobacco usage by Arizona residents? If so, how many times will this survey need to be implemented to establish greater reliability within the "mined data"?

ASU W. P. CAREY SCHOOL of BUSINESS
ARIZONA STATE UNIVERSITY

FIRST THINGS FIRST
TOBACCO TAX REVENUE FORECAST STUDY
Final Report

Dr. Tim James and Dr. Anthony Evans
L William Seidman Research Institute,
W. P. Carey School of Business,
Arizona State University

May 14, 2012

L. WILLIAM SEIDMAN RESEARCH INSTITUTE

The L. William Seidman Research Institute serves as a link between the local, national, and international business communities and the W. P. Carey School of Business at Arizona State University (ASU).

First established in 1985 to serve as a center for applied business research alongside a consultancy resource for the Arizona business community, Seidman collects, analyzes and disseminates information about local economies, benchmarks industry practices, and identifies emerging business research issues that affect productivity and competitiveness.

Using tools that support sophisticated statistical modeling and planning, supplemented by an extensive understanding of the local, state and national economies, Seidman today offers a host of economic research and consulting services, including economic impact analyses, economic forecasting, general survey research, attitudinal and qualitative studies, and strategic analyses of economic development opportunities.

Working on behalf of government agencies, regulatory bodies, public or privately-owned firms, academic institutions, and non-profit organizations, Seidman specializes in studies at the city, county or state-wide level. Recent and current clients include:

- *Arizona Commerce Authority (ACA)*
- *Arizona Corporation Commission (ACC)*
- *Arizona Department of Mines and Mineral Resources*
- *Arizona Hospital and Healthcare Association*
- *Arizona Investment Council (AIC)*
- *Arizona Mining Council*
- *Arizona Public Service Corporation (APS)*
- *Arizona School Boards Association*
- *Arizona Town Hall*
- *The Boeing Company*
- *Excelsior Mining*
- *Executive Budget Office of the State of Arizona*
- *Freeport McMoran*
- *Glendale Community College*
- *Goodwill Industries*
- *Intel Corporation*
- *Phoenix Sky Harbor International Airport*
- *PNM*
- *Raytheon*
- *Rosemont Copper Mine*
- *Salt River Project (SRP)*
- *Science Foundation Arizona (SFAZ)*
- *Turf Paradise & Delaware North*
- *Valley METRO Light Rail*
- *Waste Management Inc.*

EXECUTIVE SUMMARY

This report forecasts the annual revenue First Things First can potentially achieve from the luxury tobacco tax implemented in the state between 2012 and 2030.

First Things First currently receives $0.80 cents from the sale of every pack of 20 cigarettes in Arizona on non-tribal lands. First Things First also receives a wide range of other taxes from sales of other forms of tobacco. In 2011, this equated to 5.87% of all tobacco tax revenues generated by the state.

We forecast that the number of Arizona residents smoking could increase from just over 1 million in 2012 to 1.4 million by 2030.

We also forecast that smoking will generate $331.3 million in luxury tobacco tax revenue for the state in 2012, rising to $393.6 million in 2030, based on a number of assumptions including:

- No retail price changes after 2012.
- Constant state and federal tobacco tax rates.
- Historical consumption patterns.
- An unemployment elasticity of demand coefficient, in which there is an absolute 0.5% fall in unemployment each year until 2020, with no changes thereafter.

Based on these assumptions, we estimate First Things First revenue of $132.5 million in FY2012, rising to $157.4 million in FY2030.

To provide realistic floors and ceilings on revenue forecasts, we calculate 90% confidence levels for each annual forecast.

These suggest with 90% confidence that First Things First's revenue will range between $120.9 million in and $144.1 million in FY2012.

Projected annual revenue forecasts, with lower and upper boundaries, up to 2030 are illustrated in the following Table.

First Things First Projected Annual Revenue, 2012-2030, with Lower and Upper Boundaries

Financial Year	Lower Boundary	Expected	Upper Boundary
2012	$120,884,600	$132,511,300	$144,149,600
2013	$122,171,500	$133,849,000	$145,572,200
2014	$123,742,900	$135,613,400	$147,525,200
2015	$125,316,900	$137,393,700	$149,422,800
2016	$126,884,400	$139,172,900	$151,475,900
2017	$128,339,500	$140,845,300	$153,457,400
2018	$129,686,600	$142,432,100	$155,203,100
2019	$130,986,500	$143,985,800	$157,161,800
2020	$132,380,200	$145,543,300	$159,135,800
2021	$133,575,500	$147,131,500	$160,950,000
2022	$134,479,100	$148,286,800	$162,295,900
2023	$135,542,700	$149,411,400	$163,660,800
2024	$136,224,100	$150,549,400	$165,182,100
2025	$137,138,500	$151,662,100	$166,452,500
2026	$138,076,800	$152,797,400	$168,175,400
2027	$138,895,000	$153,929,200	$169,519,700
2028	$139,700,400	$155,069,000	$170,916,000
2029	$140,353,200	$156,221,300	$172,510,000
2030	$141,340,900	$157,446,000	$174,159,700

Source: Authors' Calculations

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1. Introduction and Objectives

First Things First is an early childhood development and health board, committed to helping Arizona children up to the age of 5 receive the educational, healthcare and family support needed to enable them to arrive at school healthy and ready to succeed.

Formed in 2006 to counteract concerns about the state's high child poverty rates, the organization is funded by a voter-enacted luxury tobacco tax (Prop. 203), and managed by a Board of Trustees in association with 31 Regional Partnership Councils.

Faced with declining revenues, caused in part by the economic recession, lower than anticipated population growth, and general changes in attitudes towards smoking and smoking consumption, First Things First approached the L. William Seidman Research Institute in late 2011 to commission a reassessment of tobacco tax revenue forecasts up to 2030.

The objectives of this report are to:

- Formulate detailed tax revenue forecasts based on an Arizona smoker segmentation and cohort analysis.
- Provide indicative sensitivity analyses and confidence levels for the tobacco tax revenue estimates, to provide realistic ceilings and floors on revenues.
- Utilize the tobacco state tax revenue forecasts to project the anticipated annual revenue for First Things First, 2012-2030, including higher and lower boundaries.

The report's findings will be used by the Board and 31 Regional Partnership Councils to formulate an effective program of attainable activities given the revenue constraints, targeting First Things First's goals and impact areas.

Section 2 of the report describes the forecast model's central inputs and assumptions. An annual forecast for the luxury tobacco tax collected by the Arizona Department of Revenue is described in Section 3. This is then used to calculate anticipated annual revenue for First Things First, with higher and lower boundaries, in Section 4. Conclusions are offered in Section 5.

2. Forecast Model Central Inputs and Assumptions

To arrive at an annual revenue forecast, we initially forecast the Arizona population up to 2030 via an update of existing population forecasts. We then calculate the smoker population cohort by age and gender, based on externally validated data for the propensity to smoke and consumption. Applying a conservative unemployment elasticity of demand coefficient to the model, we make a number of adjustments and assumptions concerning retail prices, federal and state tax rates, a year-on-year decline in the propensity to smoke, and net inward visitors. We then implement a sensitivity analysis using *@Risk* to arrive at a series of annual forecasts, with 90% confidence levels.

An explanation of each central input and assumption follows.

2.1. Population Cohorts

Our smoker market segmentation analysis consists of two stages. First, we calculate a series of population cohorts for the period 2012-2030, delineated by age and gender, then we apply a propensity to smoke rate by age and gender to each population projection cohort.

The model's population projections for the entire state (smoker and non-smoker) use the 2010 U.S. Census Bureau's Arizona population figure of 6,392,017 as a starting point.

Two publically available population projections from the Centers for Disease Control and Prevention (CDC) and the Arizona Department of Administration are consulted as part of the population projections calculations. However, neither source is up-to-date. Dating from as far back as 2005 or 2006, this results in their 2010 projections being up to 10% higher than actuality. Applying the compound annual growth rate (CAGR) forecasts from the CDC and Arizona Department of Administration population projections to the 2010 U.S. Census base figure for the state population, we initially calculate three population projections for the period 2012-2030. These are:

- A low projection, based in part on the Arizona Department of Administration CAGR.
- A high projection, based in part on the CDC/US Census Bureau CAGR.
- A central projection, based upon the mid-point or average of the low and high projections.

Our revenue forecast model uses the central projection with upper and lower bounds based on a fitted triangular distribution to reflect uncertainties about population growth rates. Table 1 illustrates the expected (mean) forecast per population cohort by age and gender, together with the minimum (lower) and maximum (upper) bounds based on the triangular distribution for the period 2012-2030.

Table 1: Population Cohort Forecast by Age and Gender, 2012-2030

	2012			2013			2014			2015			2016		
	Lower	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*
Male															
14-17	186039	187789	189537	187486	189833	192179	190515	193132	195748	196859	198234	199610	203839	204199	204559
18-24	336869	338986	341103	340397	343059	345720	342769	346064	349358	343505	347655	351802	344547	349873	355195
25-34	455483	457504	459524	465771	467736	469699	476904	477865	478826	486929	487679	488428	494452	497119	499785
35-44	426852	429597	432340	431924	436509	441092	436038	443000	449961	438655	448637	458614	441992	455158	468313
45-54	422461	423264	424067	424916	426189	427460	428487	430323	432159	432495	435147	437797	435852	439893	443931
55-64	371712	373952	376191	383704	387130	390553	395942	400522	405100	408545	414670	420792	420355	428057	435758
65+	403738	426247	448752	422620	448878	475113	441278	471935	502572	460260	496077	531879	479764	520761	561735
Female															
14-17	175328	177716	180102	176963	179777	182590	179355	182695	186033	185186	187455	189723	191939	193174	194408
18-24	315360	316549	317737	319177	320575	321972	322265	323771	325276	323284	325411	327537	323958	327360	330761
25-34	436528	438066	439604	446610	447962	449315	456795	457435	458075	465934	466231	466527	473256	474635	476014
35-44	414036	418269	422500	417806	424493	431174	421316	430607	439895	424491	436392	448290	428530	443112	457684
45-54	434613	435307	436001	436562	437679	438796	439475	441105	442734	443434	445210	446986	447441	448989	450535
55-64	409184	412483	415780	422328	427254	432177	435747	442256	448762	449623	457855	466086	462570	472837	483098
65+	522832	523847	524862	549007	549321	549635	574222	575245	576267	599389	602393	605395	624283	629855	635425

Source: Authors' Calculations

Table 1 (Continued): Population Cohort Forecast by Age and Gender, 2012-2030

	2017			2018			2019			2020			2021		
	Lower	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*
Male															
14-17	209898	210891	211884	215792	217704	219616	221278	223467	225656	226307	229198	232087	230402	234327	238250
18-24	346579	352875	359168	350465	356946	363425	358223	363579	368932	366635	371138	375640	376907	380423	383937
25-34	501511	506569	511625	508554	515687	522818	514606	523733	532857	519277	530599	541913	523034	536377	549713
35-44	446552	462819	479080	452838	471373	489903	460185	480105	500018	467926	489065	510194	477974	499202	520416
45-54	437040	442603	448164	437180	444573	451962	437946	446581	455210	440299	450073	459844	445056	455472	465886
55-64	431001	440728	450447	440240	451913	463583	447502	461618	475729	452645	469369	486088	454664	474242	493810
65+	500606	546877	593143	521962	574047	626093	544128	602616	661098	566169	632435	698671	588106	662601	737092
Female															
14-17	199014	199275	199535	205138	205704	206269	210359	211111	211863	215153	216471	217788	219065	221238	223409
18-24	326208	330334	334456	329419	333960	338500	336050	339886	343719	343627	346819	350010	352741	355265	357788
25-34	480134	483126	486118	486895	491825	496753	492654	499833	507009	497141	506559	515971	500694	512450	524199
35-44	433809	450964	468115	440164	459414	478653	447125	467844	488552	454981	476723	498463	464947	486689	508421
45-54	449786	450806	451826	451315	451733	452151	452513	452842	453171	455072	455502	455932	459324	460234	461143
55-64	474332	486663	498990	484539	498838	513129	492601	509278	525946	498335	517545	536749	500689	522379	544060
65+	649905	658750	667591	676354	689005	701647	704054	721076	738089	731911	754197	776472	759821	788007	816184

Source: Authors' Calculations

Table 1 (Continued): Population Cohort Forecast by Age and Gender, 2012-2030

	2022			2023			2024			2025			2026		
	Lower	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*
Male															
14-17	234499	239530	244558	238598	244757	250915	242647	249976	257302	246620	255190	263756	250532	260372	270208
18-24	388672	390821	392969	401676	402137	402598	411318	413511	415704	418949	424460	429967	425572	434164	442755
25-34	525732	541415	557093	527179	545529	563872	528459	549439	570409	530515	553787	577046	534376	560687	586978
35-44	488905	509371	529829	501311	520088	538854	514795	530840	546881	528838	541247	553649	542888	551395	559900
45-54	451467	462051	472633	457945	468363	478774	464514	474324	484129	471310	479802	488289	479382	486310	493233
55-64	455005	477436	499865	455353	480327	505288	456589	484058	511511	458125	488494	518855	458623	492476	526322
65+	609991	693561	777119	632071	725385	818670	654420	757720	860989	676464	790992	905446	696976	823073	949123
Female															
14-17	222979	226081	229183	226893	230945	234995	230756	235821	240884	234537	240721	246902	238266	245588	252908
18-24	363464	364843	366223	375176	375435	375694	383361	385763	388165	390486	395899	401309	396689	404827	412962
25-34	503244	517532	531808	504600	521642	538671	505703	525852	545994	507608	530104	552589	511254	536682	562099
35-44	475445	496540	517621	487311	506895	526467	499574	516991	534405	511641	526420	541189	523539	535517	547489
45-54	464662	466292	467920	469577	472114	474650	474448	477887	481324	479224	483642	488059	484912	490529	496141
55-64	501239	525201	549152	501822	527539	553241	503433	530615	557778	505406	534322	563230	506258	537393	568519
65+	787964	822901	857820	816352	858711	901060	844717	895004	945265	872996	932248	991464	899574	968535	1037450

Source: Authors' Calculations

Table 1 (Continued): Population Cohort Forecast by Age and Gender, 2012-2030

	2027			2028			2029			2030		
	Lower	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*	*Lower*	*Expected*	*Upper*
Male												
14-17	254264	265447	276623	257776	270404	283025	261069	275217	289362	264130	279898	295658
18-24	432192	444065	455931	438867	453820	468768	445448	463590	481730	451881	473282	494670
25-34	539395	569046	598685	545455	579163	612863	552392	590948	629484	560184	603880	647560
35-44	557546	561579	565610	571011	571379	571746	575364	580168	584969	578467	587828	597183
45-54	488692	494089	499483	498239	502925	507609	507143	512146	517146	516289	521950	527608
55-64	457138	494507	531862	454678	495696	536690	453379	497124	540844	454177	500355	546514
65+	716292	854517	992704	734816	884875	1034817	752419	914527	1076541	767508	942508	1117412
Female												
14-17	241817	250359	258897	245160	255022	264876	248297	259539	270776	251217	263924	276624
18-24	402893	413937	424976	409141	422894	436640	415297	431902	448503	421315	440831	460335
25-34	516032	544532	573027	521825	553934	586027	528536	564770	600989	536044	576847	617638
35-44	536087	544671	553251	549269	553934	558597	562160	562504	562847	565904	569851	573797
45-54	491900	498760	505617	500120	507813	515500	509280	517069	524852	519738	527105	534467
55-64	504872	538517	572153	502458	538631	574798	501290	539130	576956	502434	541558	580657
65+	925146	1004189	1083201	949568	1038714	1127789	972448	1072299	1172101	991942	1103562	1215103

Source: Authors' Calculations

2.2. Propensity to Smoke and Smoker Numbers by Cohort

Next, we estimate from historical data the propensity to smoke by age and gender for each population cohort, using externally validated data from the CDC, Behavioral Risk Factor Surveillance System (BRFSS), Youth Risk Behavioral Surveillance System (YRBSS), Youth Tobacco Survey (YTS), Arizona Youth and Adult Tobacco Surveys, and Orzechowski and Walker's annual tobacco study.[1]

Drawing from the mean propensity to smoke by gender and age group between 2000 and 2010, our forecast model's rates are time-constant. We also specify a normal distribution around the central estimates to reflect uncertainties. Table 2 illustrates our propensity to smoke rates by cohort.

Table 2: Propensity to Smoke by Age and Gender

	Male	Female
14-17	18.5%	16.7%
18-24	26.7%	21.3%
25-34	22.8%	18.3%
35-44	23.4%	18.9%
45-54	25.8%	20.7%
55-64	21.5%	17.3%
65+	9.9%	7.8%

Source: Authors' Calculations

Orzechowski and Walker's average annual consumption per capita of 24.8 cigarette packs in Arizona in 2010 is used in the forecast model. This equates to only half the national average consumption per capita. We also assume a 1% year-on-year total decline in tobacco consumption.

To forecast smoker numbers by cohort up to 2030, we multiply population cohort size by the propensity to smoke. The results are illustrated in Table 3. Again, we assume that these are normally distributed to reflect uncertainties.

2.3. Net Impact of Visitors

Our model includes an adjustment for the constant movement of people in and out of Arizona. Local residents travelling out-of-state, for example, in all probability purchase some of their annual tobacco consumption at their destinations, while visitors to Arizona add to local tobacco sales.

[1] See Orzechowski and Walker (2010) "The Tax Burden on Tobacco – Historical Compilation", Volume 45 – 2010.

Table 3: Arizona Smoker Population Forecast by Age and Gender, 2012-2030

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Male																			
14-17	34322	34678	35056	35665	36607	37709	38945	40203	41267	42325	43272	44233	45198	46162	47125	48082	49019	49935	50823
18-24	89171	90525	91612	92415	92839	93432	94234	95320	97092	99111	101590	104367	107389	110426	113350	115941	118585	121190	123799
25-34	102159	104383	106717	109028	111268	113421	115577	117658	119494	121060	122378	123528	124467	125358	126351	127925	129832	132140	134829
35-44	98667	100374	101990	103506	104823	106347	108137	110135	112176	114269	116637	119013	121518	124030	126461	128832	131212	133501	135555
45-54	108473	109339	110095	111163	112409	113635	114335	114844	115362	116265	117659	119359	120989	122529	123944	125625	127635	129918	132299
55-64	77622	80320	83151	86027	89066	91941	94663	97065	99150	100815	101861	102548	103168	103970	104923	105778	106214	106470	106776
65+	39869	41992	44221	46493	48871	51303	53876	56552	59367	62305	65276	68326	71462	74647	77925	81085	84183	87174	90095
Female																			
14-17	29506	29738	30083	30571	31367	32324	33345	34421	35326	36223	37020	37831	38645	39461	40281	41095	41893	42674	43430
18-24	66450	67537	68396	69078	69428	69844	70478	71252	72516	73996	75798	77841	80101	82305	84467	86372	88315	90227	92148
25-34	78365	80097	81907	83639	85247	86784	88336	89927	91391	92621	93698	94627	95378	96148	96926	98128	99564	101283	103264
35-44	77868	79116	80294	81450	82544	83815	85301	86899	88494	90173	92058	93921	95880	97790	99573	101294	103026	104778	106399
45-54	89712	90316	90808	91519	92371	93154	93531	93724	93954	94506	95488	96744	97952	99150	100344	101773	103481	105359	107280
55-64	69075	71529	74091	76692	79398	81996	84393	86504	88315	89749	90587	91076	91482	92015	92658	93190	93385	93405	93492
65+	39091	41009	43003	45033	47158	49308	51570	53938	56449	59042	61689	64420	67224	70065	72981	75821	78613	81315	83945

Source: Authors' Calculations

We use Arizona Office of Tourism data for 2011 to arrive at a base estimate for out-of-state U.S. visitors. In 2011, Arizona had 22.5 million out-of-state overnight visitors, staying on average 5.1 nights.

We also use the Bureau of Transportation Statistics' Airline Origin and Destination Survey as a proxy to calculate the number of residents leaving the state at any one time.[2] This is a 10% sample of airline tickets from reporting carriers at airports throughout Arizona. Their survey suggests approximately 12.5 million U.S. out-of-state overnight trips in 2011 originating from Arizona.

Applying a 3% CAGR to both figures and assuming a normal distribution to reflect uncertainty, our model therefore estimates net inward visitors of approximately 7 million to Arizona in 2012, rising to 13.25 million by 2030.

To calculate the impact of this visitor adjustment on tobacco sales, Orzechowski and Walker's national average consumption per capita rate of 50 packs is used, with a 1% year-on-year decline, multiplied by net inward visitors staying for a constant 5.1 days. The national average consumption per capita is approximately twice the consumption per capita in the state.

2.4. Prices and Taxes

Our model assumes the average price of a pack of cigarettes in 2012 is $6.89, with the price remaining constant in real terms thereafter.

We also assume that the state tax of $2 per pack and federal tax of $1.01 per pack remain constant throughout the forecast period. This is in part due to the absence of a forecast for tobacco tax and price changes in the public domain, but can be amended at a later date.

The model includes a price elasticity of demand co-efficient (-0.611) derived from our econometric estimates for Arizona.[3]

The impact of the economy on in-state tobacco sales can be reflected in the model in two ways. These are through a Gross State Product (GSP) elasticity of demand or an unemployment elasticity of demand. Our model does not use both methods since they effectively reflect the same exogenous variable. In the long-run, these give rise to very different revenue forecasts.

Research suggests that the higher the GSP, the greater the level of tobacco sales. It also suggests that cigarette consumption increases as unemployment falls, until the natural rate of unemployment is reached. An unemployment elasticity of demand coefficient therefore provides a more conservative revenue forecast, as it fails to account for the boost associated with any growth in the economy

[2] www.btrans.gov

[3] This price elasticity of demand coefficient fits with other externally validated evidence.

unrelated to unemployment reductions. The revenue forecasts described in this report use the more conservative unemployment elasticity of demand.

Using a 2011 state-wide unemployment rate of 8.86%, we assume a 0.5% absolute fall in unemployment each year until 2020, with unemployment remaining constant thereafter.

2.5. Non-Cigarette Adjustment

Although cigarette tax accounts for by far the greatest share of tobacco tax revenue raised by the state, other forms of tobacco tax also generate revenue, as illustrated in Table 4 below:

Table 4: Net Inward Visitor Cigarette Pack Consumption Forecast, 2012-2030

Tobacco	Total State Tax Rate
Smoking tobacco and snuff	$0.233 per oz.
Cavendish plus plug or twist	$0.055 per oz.
Small cigars weighing not more than 3lbs per 1000	$0.441 per 20
All other cigars retailing at not more than $0.05 each	$0.218 per 3
All other cigars retailing at more than $0.05 each	$0.218

Source: Arizona Department of Revenue

We estimate the proportion of tax revenue from non-cigarette sources for the period 2012-2030, based on data supplied from the fiscal year (FY) 2004 to FY2011.

2.6. Revenue Split

We assume that First Things First will receive an approximate 40% split of total tobacco tax revenue received by the Arizona Department of Revenue, year-on-year.

2.7. Impact of Tribal Lands

We do not make any adjustment for the impact of tobacco sales on tribal lands. It is beyond the capabilities of the current report to estimate the extent to which tobacco tax revenue is lost to illegal sales on tribal lands.

3. State Luxury Tobacco Tax Revenue Forecasts, 2012-2030

To arrive at annual forecasts of state luxury tobacco tax revenue for the period 2012-2030, we enter the central inputs (and their associated specified distributions) described in Section 2 into an *Excel*-based model that utilizes *@Risk*. *@Risk* answers a series of "what if" questions, designed to assess the sensitivity of each annual forecast to variations in key determinants. It uses Monte Carlo simulations to look at all possible outcomes, and the likelihood of their occurrence. That is, it uses the estimated distributions for a wide range of user-defined factors to provide a probability distribution and confidence interval for each forecast.

Table 5: Arizona's Projected Annual Luxury Tobacco Tax Revenue, 2012-2030

Financial Year	Lower Boundary	Expected	Upper Boundary
2012	$302,211,500	$331,278,250	$360,374,000
2013	$305,428,750	$334,622,500	$363,930,500
2014	$309,357,250	$339,033,500	$368,813,000
2015	$313,292,250	$343,484,250	$373,557,000
2016	$317,211,000	$347,932,250	$378,689,750
2017	$320,848,750	$352,113,250	$383,643,500
2018	$324,216,500	$356,080,250	$388,007,750
2019	$327,466,250	$359,964,500	$392,904,500
2020	$330,950,500	$363,858,250	$397,839,500
2021	$333,938,750	$367,828,750	$402,375,000
2022	$336,197,750	$370,717,000	$405,739,750
2023	$338,856,750	$373,528,500	$409,152,000
2024	$340,560,250	$376,373,500	$412,955,250
2025	$342,846,250	$379,155,250	$416,131,250
2026	$345,192,000	$381,993,500	$420,438,500
2027	$347,237,500	$384,823,000	$423,799,250
2028	$349,251,000	$387,672,500	$427,290,000
2029	$350,883,000	$390,553,250	$431,275,000
2030	$353,352,250	$393,615,000	$435,399,250

Source: Authors' Calculations

Table 5 summarizes the *@Risk* output, which provides an expected revenue scenario each year (expressed in 2012$) throughout the period 2012-2030. For example, it forecasts that, all other things being equal, Arizona Department of Revenue could generate approximately $331.3 million in total from the luxury tobacco tax in FY2012. Table 5 also displays a lower and upper boundary each year, based on a 90% confidence interval. For example, we forecast with 90% confidence that the total tobacco tax collected by the state in FY2012 could be as low as $302.2 million, or as high as $360.4 million.

4. First Things First Revenue Forecasts, 2012-2030

First Things First currently receives $0.80 from every $2 of tax collected by the State from the sale of a pack of 20 cigarettes. It also receives a wide range of other tax rates from other forms of tobacco previously illustrated in Table 4 (page 10). However, the total tax revenue collected from other forms of tobacco in FY2011 equated to only 5.87% of gross cigarette tax revenue. As a result, we provide an annual revenue forecast for First Things, based on a 40% share of total tobacco tax revenue received by the Arizona Department of Revenue. This is illustrated in Table 6.

Table 6: First Things First Projected Annual Revenue, 2012-2030

Financial Year	Lower Boundary	Expected	Upper Boundary
2012	$120,884,600	$132,511,300	$144,149,600
2013	$122,171,500	$133,849,000	$145,572,200
2014	$123,742,900	$135,613,400	$147,525,200
2015	$125,316,900	$137,393,700	$149,422,800
2016	$126,884,400	$139,172,900	$151,475,900
2017	$128,339,500	$140,845,300	$153,457,400
2018	$129,686,600	$142,432,100	$155,203,100
2019	$130,986,500	$143,985,800	$157,161,800
2020	$132,380,200	$145,543,300	$159,135,800
2021	$133,575,500	$147,131,500	$160,950,000
2022	$134,479,100	$148,286,800	$162,295,900
2023	$135,542,700	$149,411,400	$163,660,800
2024	$136,224,100	$150,549,400	$165,182,100
2025	$137,138,500	$151,662,100	$166,452,500
2026	$138,076,800	$152,797,400	$168,175,400
2027	$138,895,000	$153,929,200	$169,519,700
2028	$139,700,400	$155,069,000	$170,916,000
2029	$140,353,200	$156,221,300	$172,510,000
2030	$141,340,900	$157,446,000	$174,159,700

Source: Authors' Calculations

Table 6 summarizes the *@Risk* output, to provide an annual expected revenue scenario (expressed in 2012$) up to 2030. For example, it forecasts that, all other things being equal, First Things First can reasonably expect to receive approximately $132.5 million from the luxury tobacco tax collected by the Arizona Department of Revenue in FY2012. However, to provide a realistic floor on revenues, Table 6 also provides confidence levels for each annual forecast. For example, it suggests with 90% confidence that First Things First's revenue in FY2012 could range between $120.9 million and $144.2 million. By 2030, First Things First's share of the tobacco tax revenue could range between $141.3 million and $174.2 million.

5. Conclusion

The purpose of this report is to provide an annual revenue forecast for First Things First, to enable the organization to effectively plan for the future.

Our development of a robust series of forecasts is quite challenging, due to the unavailability of smoker cohort data, and the inadequacy of state-wide population forecasts which have not been updated since 2005-06.

Nevertheless, we attempt to update two publically available population projections from the Centers for Disease Control and Prevention (CDC) and the Arizona Department of Administration, and develop a smoker cohort forecast using externally validated data from the CDC, Behavioral Risk Factor Surveillance System (BRFSS), Youth Risk Behavioral Surveillance System (YRBSS), Youth Tobacco Survey (YTS), Arizona Youth and Adult Tobacco Surveys, and Orzechowski and Walker's annual tobacco study.

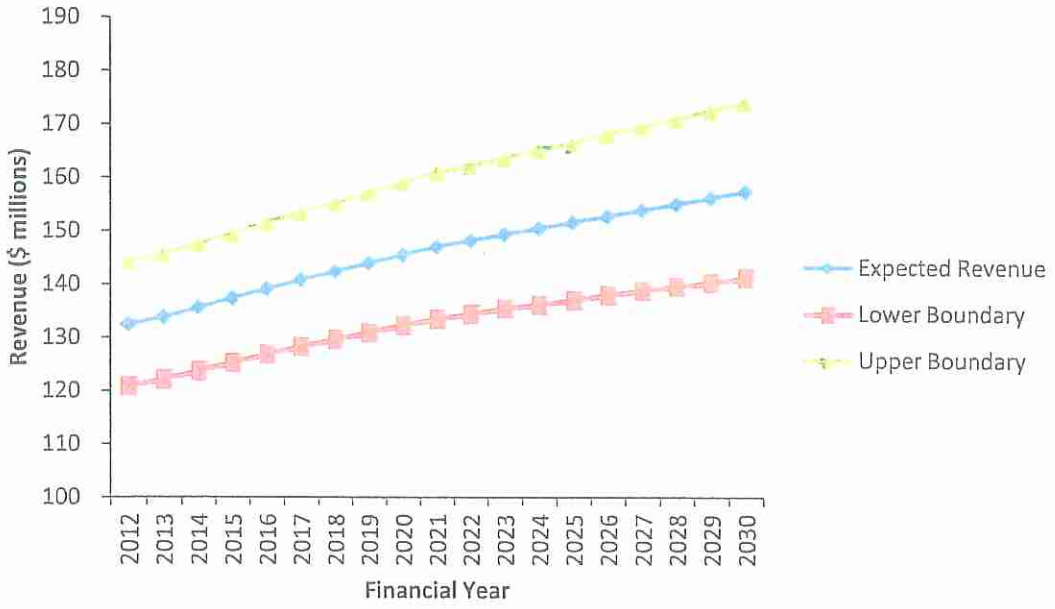
To arrive at an annual forecast, we build a number of assumptions into our model, which could impact future revenue. These include no retail price changes after 2012, constant state and federal tax rates, specific changes in the annual rate of unemployment, a constant price elasticity of demand rate, an estimate for the proportion of tax revenue from non-cigarette sources based on historical data, a visitor adjustment, and an assumption that First Things First will continue to receive approximately 40% of all state tobacco tax revenues.

Of more importance, perhaps, First Things First's recommendation to use unemployment elasticity of demand to reflect the state of the local economy leads to a more conservative estimate than a model using GSP elasticity of demand.

However, our model is flexible enough to enable at least some changes to these assumptions to be made, to produce a revised set of forecasts within a couple of business days.

Based on these assumptions, we forecast expected revenue of $132.5 million for First Things First in FY2012, rising to $157.4 million in FY2030. However, to provide a realistic floor on revenues, we calculate confidence levels for each annual forecast, to indicate the likely range of revenue each year. This is shown in Figure 1. For example, Figure 1 suggests with 90% confidence that First Things First's revenue in FY2012 could range between $120.9 million and $144.2 million. In FY2020, it could range between $132.4 million and $159.1 million, with expected (mean) revenue of $145.5 million. In FY2030, it could range between $141.3 million and $174.2 million, with expected (mean) revenue of $157.4 million.

Figure 1: First Things First Expected Annual Revenue, 2012-2030 at 90% Confidence Level



Source: Authors' Calculations

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